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more personal aspects particularly is frowned upon by elders in open but tacitly approved in fact. In contact with white people the Pukapukans always speak and act as if they heartily believed and followed the missionary code. It took us many months to persuade them that we did not care to pass judgment upon what they thought and did but that what really interested us was to find out what these acts and thoughts were. As informants gained confidence in us, they dropped their usual attitude of "being on their best behavior" when we were present and were much more natural and free. This attitude of confidence was sufficient for us to gain insight into some of the more implicit phases of Pukapukan life, but even at the end of our stay we were baffled in our attempts to penetrate far below the surface. The cultural veneer of mid-Victorian morality is sufficiently deep to withstand any penetration save that based on long years of patient probing.

White contact has affected least of all the economic life and the manufacture of native articles. Though many Pukapukans today live in coral lime houses in the permanent villages, native houses still predominate, especially in the copra-making villages. The people wear European clothes; the women wear dresses, the men trousers and, when not working, shirts as well. The use of native clothing had almost disappeared by 1934. Because there has been little money available to buy fresh clothes some women now eke out the life of old rags by wearing coconut-leaf kilts over these during working hours. Boys under 12 or 13 years of age go naked for the most part, reserving pants and shirts for school and church wear. Girls wear dresses from the tenderest age onward. Presumably this tendency would be reversed if the first missionaries had been women.

Every household is supplied with knives, usually a cooking pot, tins as drinking utensils, and mosquito nets. Fishermen commonly use iron fishhooks but they still largely retain the use of native fishlines. Native plank canoes, lashed with sennit, are in common use, the several flat-bottomed European boats being used only for transport of copra and cargo over the reef. Beyond these obvious changes, economic life functions today largely according to old patterns. The few items that could not be made for the Bishop Museum collection consisted mainly of plaited garments apparently infrequently worn in the old days.

LIMITATIONS OF MATERIAL

Data on the more personal and implicit aspects of the culture were obtained from special informants with whom we had built up a confidential friendship, usually without the medium of an interpreter. The material on formal social life, save where it relates to the old-time governing authorities, to the powers of the chiefs and elders, or to the general tapus surrounding the chiefs, is reasonably reliable. Questioning of informants has been sup-

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857 Young children sleep whenever they are tired. Children
513 from about 6 years of age onward average about 8 hours of sleep each night. Fires are occasionally kept burning late into the night when mosquitoes are troublesome.

514 Men micturate in a standing position; women squat on the heels or stand with knees bent. Both sexes defecate in a position squatting on both heels.

412 Cutting habits vary according to the instrument employed. In general, a knife is moved away from the body, a native cutting or scraping instrument toward the body. Adzing is, of course, toward the body.

483 Heavy weights, such as canoes, are lifted from the ground with the arms in front of the body and carried just clear of the ground. A house roof is carried on the shoulders of a number of men who get inside the roof while it is on the ground and hoist it onto their shoulders. A few coconuts are
482 carried in the hands, with or without a basket; a large number are balanced on the shoulder. Many coconuts are carried on a rough carrying pole, weighted at both ends and balanced at its middle point on the shoulder. The right shoulder is generally preferred. Women generally carry weights balanced on the head, using a pad made of a bunch of leaves placed between the head and the burden.

481 Climbing coconut trees and coconut husking are described on page 86.
515 Swimming is naturally acquired behavior and is not taught to children. Pukapukans are not great swimmers or divers, but use the sea mostly for bathing,
526 when they run or wade from the beach and then suddenly duck. Children
226 are in the water a great deal; they play at water splashing, surface diving, and underwater swimming games. Adults rarely play swimming games. In diving for *Tridacna* shellfish, adults dive from the surface by elevating the buttocks and depressing the head.

516 Casual observation indicates that left-handedness (*lima maysi*) is common in both children and adults. This was observed in adults in the use of implements and in the handling of darts in games, in children when dancing.

The toes are used extensively for picking up objects from the ground and for holding objects when both hands are engaged and when purchase is required.

501 Both men and women pole and paddle canoes today. The individual poles a canoe sitting, standing on the floor of the canoe, or standing with one foot on each gunwale. Paddling is done on either side of the canoe with equal ease. The paddle is grasped with both hands, fingers pointing to the front, thumbs to the rear. It is unusual for a canoe crew to sing or chant in rhythm
[461] to the paddling. The paddle is plunged vertically into the water and the stroke is fore and aft. Two types of strokes are used: *alo atu pele* is a long, even, powerful stroke with the full stretch and strength of arms and shoulders, dipping the paddle blade deep into the water, and used for long distances when consistent power is required; *alo tuinga* is a short, quick, shallow stroke,

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

301 almost a jab of the blade into the water, used when a sudden spurt of speed is required to take advantage of a following wave to shoot across the reef. In steering, the paddle is struck into the water as far away as possible and then pulled back through the water.

GESTURES AND EMOTIONAL EXPRESSIONS

201 Various conventional gestures are used for communication without speech. Affirmation (*uatotiko*) is expressed by raising the two eyebrows without moving the rest of the face. Used in answer to a negative question, the gesture indicates that the statement in the negative is correct. Doubt is expressed by screwing up the nose and mouth, wrinkling the forehead, at the same time nodding the head. A distant place or person is indicated by pointing with the forefinger. In beckoning to a person, the arm is flexed with the palm pointing toward the person addressed, and the fingers are closed against the palm and quickly opened. The motion is repeated if necessary. Height is indicated by the outstretched arm, palm pointing to the ground. The size of a fish is always indicated by marking off its approximate length with the 261 fingers of one hand on the other arm. A gesture of insult consists in point- 578 ing the fundament toward the person insulted; at times the gesture is accompanied with words like "Tau kanokano" (Your anus). Pointing and shaking of the forefinger accompanies the hurling of verbal insults at another person. Other attitudes which occur in story telling are mentioned elsewhere (1). Concentration or the exertion of intense physical effort is marked 609 by semi-protrusion of the tongue, grinding of the teeth, or contorting of the face. Shyness or embarrassment in the presence of white people is shown 156 by women and children turning away the head, or lowering the head and covering the mouth, nose, and lower part of the face by the palm and spread-out fingers of the hand. No man was ever observed displaying this gesture. 869 Naked children who become suddenly self-conscious at the approach of a white person cover the genitals with the hand.

Display of affection is marked by pressing the nose against another per- 201 son's face or other part of the body, at the same time inhaling (*yongi*) 576 through the nose. The nose is often applied to the back of the hand of a white person. An excellent account of leave-taking after a visit is given in 832 detail in the story of Te Malo and Totolea (1). The common greeting on the road is "Ka mano koe ki wea?" (Where are you going?). The person addressed answers in detail or in evasion according to his inclination.

827 Sneezing is a sign that someone elsewhere is talking about the sneezer, probably in a gossipy or scandalous fashion. Yawning merely expresses 516 bodily fatigue.

356 Both men and women are noticeably given to the habit of leaning against each other in close bodily contact on every occasion. A group of men stand-

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

[501] Informants stated that in former days there were fewer canoes than today. A tapu (*lani*) for protecting a canoe tree was instituted by making four cuts on the bole of a tree, about 6 feet from the ground. Most canoes, especially the large ones, were the property of the paternal lineage groups, each of which might own from one to three canoes. As the canoes belonged to the corporate entity, no problem of inheritance arose.

The ownership of nut trees has already been mentioned. Like trees in the reserves, individually owned trees are protected by a tapu of a coconut midrib. *Pukama* trees are also individually owned and are very valuable in that the leaves provide the best plant material for fertilizing (*wakalepo*) the talo beds. *Pukama* and coconut trees are planted over the buried afterbirth of the new-born child along the boundaries of homestead lots. Individual control of *pukama* trees is carefully guarded. During the season for mulching (*wakalepo*) the talo, it is not uncommon for two women to enter into physical encounters over rights to *pukama* trees which both claim to control.

Individual named talo beds (*ui tangata taki tai*)—twenty-two in all on Wale (see pl. 1, *A*)—are inherited in the male line, or according to bequest. They have been excavated and named by individuals in the past. Some of the names of owners, as given by informants, refer to living people, others to the original makers of the beds, one or more generations back. Few Ngake talo beds remain on Wale; most private beds were situated close to the old site of Ngake village at Umpoa, and were destroyed by the tidal wave that overwhelmed the village in 1914. The beds were filled in with sand, and have since been planted with nuts; new talo beds are being excavated now on Motu Ko.

Inheritance of other items of personal property is according to rule or by right of bequest (*wakawiti*). When an individual dies, much of his property—adzes, pearl-shell hooks and ornaments, malos, sleeping mats—is buried with him. If he dies intestate, all that remains after the survivors have fulfilled the last duties to the deceased is divided among the children, blood and adopted. When an individual has made a bequest before death, his property is divided accordingly. Fear of retribution by the spirit of the deceased if the terms of the bequest are not strictly carried out insures that the last wishes of the dying man will be fulfilled.

The house is generally inherited by children or paternal male relatives of the deceased. Two exceptions in which the house was inherited by the wife of the deceased came to light in the census.

In one household in Yato, the mother is a Loto woman, twice married. Her first marriage was with a Yato man, and residence was patrilocal. When her husband died, the widow inherited the house and occupied it in Yato. When she remarried, her second husband came from Ngake to live with her in this house. In a household in Ngake, a widow and her children continue to reside in the deceased husband's house. The widow is referred to as the owner of the house, but since her children are young,

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

A man catches his *kalowa* bait in the morning. Besides his fishing gear and two or three coconuts for his day's lunch, he takes with him coconut-leaf mats (*pola lauvia*) which provide protection from sun and rain and serve as sails. A mat leaning against the fisherman's back while he waits for a bite is easily thrown aside when strenuous activity is required to haul up the fish on the line before the sharks can take the fish from the hook. When the canoe is lodged to the reef and there is only a gentle breeze blowing offshore, a mat sail is used to prevent drifting onto the reef, thus obviating the necessity of paddling out from the reef again and again. A big sail in a fishing canoe would be cumbersome and would catch too much wind. A mat standing up in the canoe, with vertical midrib base and light guys running to outrigger booms providing support, gives sufficient belly to catch the wind and keep the canoe off the reef without dragging anchor.

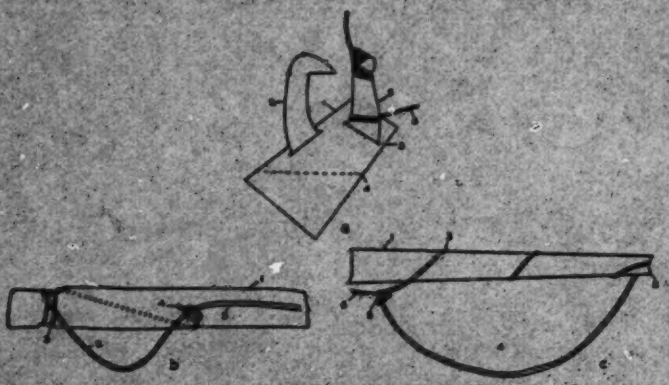

FIGURE 4.—Implements for fishing and bird snaring. *a*, fishhook with bait attached: any dead fish bait (*manua mate*) is attached to old style hook by removing head from bait fish and stripping off fillet (1), excluding backbone from belly backward so that flesh remains whole; hook (2) thrust through tail end (3) of fillet from flesh side, back through head end of fillet from skin side; fillet folded (4) along hook (dotted line), flesh side outward, skin side inward, and tail end of fillet lashed to shank (5) of hook, near shank knob, by transverse turns of bait string (6), fastened with half hitches. *b*, bird noose (*yele wawa*): pole (1) about 12 feet long, 2 inches in diameter; noose (2) two-ply twisted sennit; one end of sennit passed transversely around notch end of pole (3), then down underneath two transverse turns; short free end (4) tied in square knot on bight; running end (5) passes down pole to bird catcher's hands at proximal end. *c*, fish noose (*hawyele*) (CB152): wooden support (1) of *puapua* wood about 6 feet long, ½ inch in diameter at proximal end, ¼ inch in diameter at distal end which is notched (2); noose cord (3) of strong, three-ply twisted wau, wound around support, passed over notch (2) to form noose (4); free end knotted on bight (5) and cord (6) passes to proximal end of support.

Tuku moana fishing from a stationary canoe outside the reef with dead bait differs in two respects from both *kalu* and *tasalo* fishing: *tuku moana* fishing is deep-sea hand-line fishing up to about 300 fathoms and involves

1;Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

322 Formerly wood was too precious for any man to risk failure and wastage of wood by building a canoe himself; and today, when most men consider themselves fairly skilled with the iron adz blade, the tendency is for the layman to make for himself only a rough dugout, retaining the services of the expert for his plank canoe. The following men are considered the expert canoe builders on the island today: in Ngake village, Tiele, Iti, Iliilia, Te Ingoa, Tualai, Veti; in Loto village, Pau and Nawani; in Yato, Tuli. The men of the Ngake group are all related. Iliilia and Tualai began as helpers (*kau tuinga*) to Pau and Te Ingoa. They have since set themselves up as independent experts. Iti has just finished his first plank canoe which is generally conceded to be of the first quality. Hence Iti will soon be given his first commission, probably by a relative. Nawani is now too old to build canoes himself, but gives advice when required and is generally considered to have passed into the class of consulting experts. Tuli is the only man of his [501] family group who is an expert. The largest canoe on the island (60 feet long, 13 seats) was built by Te Ingoa, believed by some to be the cleverest builder on the atoll today.

In general, a craftsman draws his assistants from his sons, brothers, or relatives, who serve voluntarily and are taught by the master all the skills of the craft, thus keeping the knowledge within the same family group. The assistants begin by sharpening the edges of the adzes as these are blunted and handed to them by the experts. They are given small jobs such as roughing out the shape of the stern piece, or making the preliminary adzing of the hull interior. Later they graduate to the more difficult finishing and fitting jobs where much skill is required to avoid bungling and wastage. In order to become a master, an apprentice must make himself a plank canoe. People come to watch his work, closely examine it from stage to stage, and entrust their own work to the would-be master craftsman only if the completed canoe passes a final criticism.

322 The chief craftsman directs all his assistants and is solely responsible for the completed canoe. He selects from the bush the principal tree for the 313 hull and the other trees necessary for hull and superstructure. The felling and rough trimming of these trees is done in the bush. Bark is removed and sections of trunk with short grain are set aside for the canoe hull, sections with longer grain for superstructure. Formerly the hull was roughly shaped in the bush by firing and adzing. Today this is done by adzing only and the hull is carried or hauled to the shady place near the beach 322 which has been set aside as a workshop. The place Matatoki on Loto beach was a well-known canoe-building yard in former days. Each expert has his own favorite workyard (*tonga vaka*) where canoe timbers may be slowly seasoned in the shade before use. Today the owner has his canoe built near his own house that he may more directly oversee the workmen's

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

The shell is cut along the section lines with the turtle-shell cutting implement (*taku*) or with a similarly shaped implement made from *punga* coral (*taku punga*). The edge of the blade is rubbed back and forward along the division line judged with the eye. A scratch is soon made on the nacreous surface of the shell. By further rubbing along this scratched line and by the addition at frequent intervals of water and sand, if the cutting implement is turtle bone, a narrow groove is formed which is finally deepened until the shell is cut through. A cut section of shell is shaped by rubbing and grinding with coral stone and water. Later the shape of a hook is filed out by the use of the shark skin rasp (*kauna*).

To smooth the outer convex surface of pearl shell, the shell is rubbed on a large piece of *punga* coral placed on the ground in front of the worker. Water is used copiously on the rubbing surface. At intervals the shell is dipped into a bowl of clear water or the surface of the shell is rubbed with the fibrous end of a ripe pandanus key to test the sheen and the stage of polishing reached. When the worker is satisfied that he has procured the desired color, he gives the surface of the shell a final polish by rubbing it vigorously with a dry pandanus leaf.

Lashing or suspension holes are made in shell pieces by the use of the pump drill.

Informants could suggest no ceremonial used in the manufacture of pearl-shell ornaments or composite hooks.

The shark-skin rasp is prepared as follows:

The skin of a freshly killed fish is submerged in fresh water for about eight days. The skin is pegged out in the sun with wooden pegs until thoroughly dry. It is cut into pieces of suitable length and attached to a forked branch. A piece of skin that is flat longitudinally and transversely is attached to a branch to make the *kauna olo* used for smoothing and polishing fishhook shanks. For the *kauna punga* which is used to cut out the curves of composite hook points and the bend of a single-piece hook, a piece of shark skin is scraped on the fleshy surface to remove the stiff membranes. This allows the skin to curl transversely and produces a file, round in cross section (fig. 23*b*).

Shark skin is used for all purposes where a coarse abrasive is needed. The tail of the black ray (*uwi kaue*), also used as a file in the manufacture of pearl shell, is preferred by some because it lasts longer than shark skin.

CANOE CONSTRUCTION

Two types of canoe are used in Pukapuka today. One, the simple, one-piece, dugout canoe, is used for fishing inside or outside the reef. The other, a plank canoe with washstrakes and bow and stern covers, is used for fishing and for making expeditions to the islets of Ko and Koawa. Canoe making is a craft still very much alive in Pukapuka and most households possess two or more canoes, one a dugout, the others larger plank canoes.

The single-piece dugout (*poti pukaua*) does not seem to be an old style canoe. The only name for it is *poti*, a word probably derived from the English word boat; if this derivation is correct, it is evidence in support of informants' contention that the canoe style is new. Informants suggested that formerly there were not sufficient big trees on the atoll to enable craftsmen to make single-piece canoes. The *poti* in use today is a simple hull balanced by outrigger and two cross booms.

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501 Canoes built on old style models are the small plank canoe (*sutai*) with washstrakes, bow and stern covers; the large plank canoe (*vaka tui tuta*; pl. 5,*A*) with through and through lashing of the hull and washstrake sections; another large plank canoe (*vaka tui sutali*; pl. 5,*B*) with inside flange lashing of the hull sections; the large double canoe (*taulua*) in which two canoe hulls are lashed together by cross booms. The number of outrigger booms in all types of canoes ranges from two to six, two being common. Multiple booms are used for some large canoes.

[825] There is no origin legend for any of these types of canoe save the bare
173 statement that the first canoes were modeled on the shapes of the whale
186 and a species of shark. A fragment is told, however, which indicates an
322 early consciousness in Pukapuka of the superior workmanship of Samoan canoe builders. Two Samoan craftsmen, Kaviki and Vailaki, came to Pukapuka during a voyage of exploration. During their stay in Pukapuka, they engaged in a competition to see who could build the better canoe after the Pukapukan models. Kaviki made a *tui tuta* canoe, Vailaki a *tui sutali* canoe. In both, the hull sections were so closely joined that none could see the seams on the outside of the hull. There is no tradition that the two Samoans affected in any way Pukapukan canoe-building technique.

322 Preferred woods for canoe building are: *makamoa* and *uvitou* for hull sections; *puapua* for washstrakes and outrigger cross booms; *pukamu* for the outrigger float; *ngangie* for outrigger connecting pegs, diagonal braces, and lifting bars. Most single-piece dugout canoes are built of *pukamu* (hence its name, *poti pukamu*), with outrigger float of the same wood and connecting pegs of *ngangie* wood.

322 FIGURE 24.—Medium-sized Pukapukan canoe in Bernice P. Bishop Museum: outrigger detached for storage; lashing together of canoe hull by through-and-through
501 method; metal plates have been added to outside of hull joins to protect sennit lashings from being severed by sharp coral. (Reproduced from Macgregor, 20, fig. 8.)

FIGURE 25.—Six-boom canoe. *a*, view of starboard side: 1, bow section of hull; 2, middle sections; 3, stern section; 4, washstrake; 5, fore section of bow cover; 6, after section of bow cover; 7, forward wave guard; 8, stern cover; 9, after wave guard and bait deck; 10, stern cover decorative crest; 11, bar rest for trolling pole, used also as seat; 12, spar below which lifting poles are inserted to carry canoe; 13, stern outrigger boom; 14, bow outrigger boom; 15, secondary outrigger boom made necessary by heavy weight of large outrigger; 16, middle outrigger boom. *b*, top view: 1, bow cover sections; 2, stern cover; 3, gunwale; 4, wider upper edge of hull; 5, outrigger boom, extending in this large canoe well beyond starboard side; 6, outrigger float; 7, secondary boom running to (8) longitudinal spar; 9, seat with hole for supporting mast, a modern method of support found on only a few canoes; 10, connecting pegs between boom and float; 11, diagonal brace between boom (5) and outrigger connecting pegs (10). Canoe lashed by through-and-through method, used mainly for transporting supplies between Yato, the village of its owner, and Motu Kotawa. (Reproduced from Macgregor, 20, fig. 9.)

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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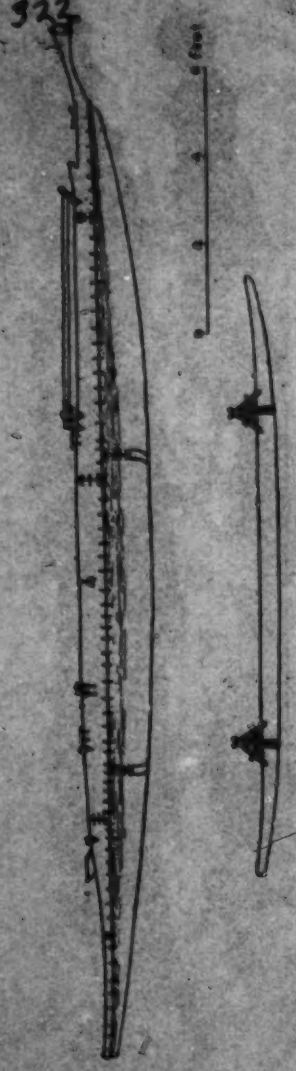

FIGURE 24.

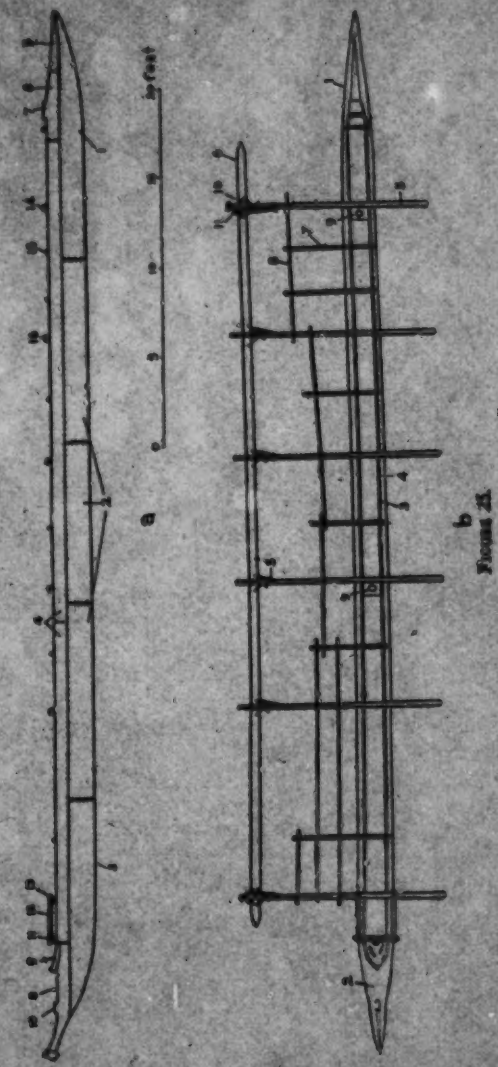

FIGURE 25.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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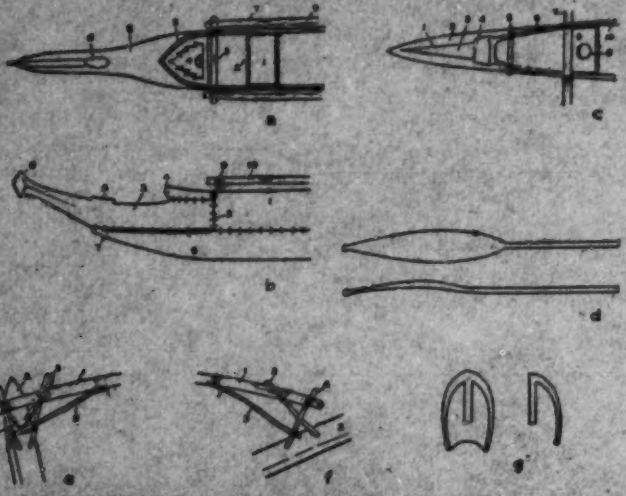

FIGURE 26.—Details of six-boom canoe. *a*, stern, top view: 1, stern seat; 2, groove under after edge of stern seat for holding bonito rod in place, sennit grommet in which handle of pole rests not shown; 3, groove cut in aft crossbar against which rod rests; 4, bait deck; 5, stern wave guard; 6, cleat on stern cover; 7, short longitudinal spar; 8, stern cover; 9, gunwale. *b*, view of starboard side: 1, washstrake; 2, stern cover; 3, through-and-through lashed join of washstrake and stern cover; 4, raised side piece of wave guard lashed to stern cover; 5, cleat; 6, fishtail-shaped stern cover; 7, outer rod caulking over join between stern cover and (8) after section of hull; 9, bar rest for trolling rod; 10, short longitudinal spar between which and top of washstrake (1) lifting poles are inserted. *c*, bow: 1, fore section of bow cover; 2, after section of bow cover, lashed join between fore and after sections not shown; 3, deck of bow cover; 4, bow wave guard; 5, forward cross lifting bar; 6, lashing of aft end of bow cover to forward end of washstrake; 7, bow outrigger boom, lashed across washstrake; 8, bow seat with hole (9) for forward mast (modern technique of stepping mast); 10, washstrake. *d*, canoe paddle (*wee*) of *puhaoa* wood, face and side view: handle 2 feet 4 inches long, about 1½ inches in diameter; blade 2 feet 7 inches long, greatest width 5⅜ inches; terminal knob 1¾ inches long, 1 inch thick; weight of paddle 3 pounds; one side of paddle blade convex transversely, slightly concave longitudinally; other side slightly convex longitudinally, flat or faintly concave transversely; distal end of blade with faint mesial transverse ridge which meets two edges (*hauhau*) of blade to produce terminal knob with four sides and blunt point; paddles range in length from 4 feet 8 inches to 5 feet 8 inches, blades 5 to 6 inches wide; size and weight depend on choice and strength of maker. *e*, outrigger boom, end attachment: 1, bow boom; 2, outrigger float; 3, inner pair of connecting pegs, crossed above boom and running obliquely outward to float; 4, outer pair of pegs; 5, diagonal brace between boom and after connecting pegs of inner and outer pairs; 6, suspensory lashing holding float to boom. *f*, middle boom attachments found only on larger canoes such as this six-boom canoe: 1, outrigger boom; 2, outrigger float; 3, inner connecting peg; 4, outer connecting peg; 5, diagonal brace between boom and outer connecting peg. *g*, canoe bailer (*tata*) of *vaikauvo* wood top view and longitudinal section; handle projects from mesial line of top of back; sides and bottom rounded and meet at back in slight mesial longitudinal ridge which continues along outside bottom of bailer to meet customarily beveled lip (not shown); bailer 14 inches long, 6¾ inches wide, 3 inches deep; lip bevel ¾ inch wide; weight of bailer 2 pounds. (Reproduced from Macgregor, 20, fig. 10.)

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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192 The Pukapukan *tui tuta* canoe is shown in figures 24, 25, 26 and plate 5A. The native names for parts of the plank canoe are given in the following list:

Mua vaka: fore section of hull.
Wualoto: central section of hull.
Muli vaka: aft section of hull.
Oa: washstrakes.
Velo: stern cover, shaped like fishtail.
Laulau velo: after projection of stern cover.
Talamoko: raised cleat on stern cover.
Wakakauvae wonu: raised bait deck on stern cover, fashioned from cover or built up with extra wood.
Tuku: place inside wakakauvae wonu where bait and line are laid.
Kalemu: extreme after point of after section of hull.
Tala tuki: point of bow.
Tuki: forward part of bow cover.
Puka: second section of bow cover.
Tala puka: wave guard on bow cover.
Malae puka: top of wave guard.
Pu oyo: place covered by bow cover where provisions and fishing gear are stored.
Kaukau: outrigger cross booms.
Kaukau mua vaka: forward outrigger boom.
Kaukau muli vaka: aft outrigger boom.
Kiato: longitudinal spar supporting cross booms.
Mana poto: additional short cross booms, supporting kiato and running from strakes to spar.
Ama: outrigger float.
Mata ama: bow and stern points of outrigger float.
Tutuki: connecting pegs between outrigger float and cross booms.
Tutuki tokai: diagonal bracing strut running from inner pair of pegs to boom.
Oanga: suspensory lashing supporting outrigger float.
Manu ki mua: forward lifting bar.
Manu ki muli: stern lifting bar.
Manu a lua: crossbar aft of after cross boom.
Palepale langayu: short longitudinal spars lashed on either side of washstrake to lifting bar and cross boom.
Lakau iki: lifting pole.
Twinga iki: sennit lifting loops fastened to starboard washstrake just aft of cross booms.
Yeke: seats formed by cross booms and lifting bars.
Tau muli: rear seat just forward of rear lifting bar.
Kaukau matau: starboard side.
Kaukau ama: port side.

322 The hull is in three sections lashed together (*tuta*) with three-ply braid which
501 passes through holes (*pu*) bored (*yuki*) through the hull with the shell implement
284 termed *yuki suka*. A shell borer might be lashed to a wooden holder about 6 inches long, to make the implement called *wuwa*. The point of the shell was held against the wood with the left hand and the wooden holder tapped smartly (*paopao* or *tukituki*) with a mallet of *kaupapa* coral or a whale's tooth (*tukituki paopao tuka*). The point was then worked gently from side to side (*luchue* or *wukiwuki*) to enlarge the hole. Tapping and working from side to side continued until a hole was made through the wood. The *wuwa* was then twisted (*yuki*) and worked back and forth until the hole was of the required size. The lashing forms a criss-cross pattern (*lu karua lua*, fig. 27*d*). Washstrakes (*oa*) are added to the hull sections with a single diagonal lashing (*lu kaua tai*, fig. 27*a*). Where the *oa* are in several sections, the edges of contiguous

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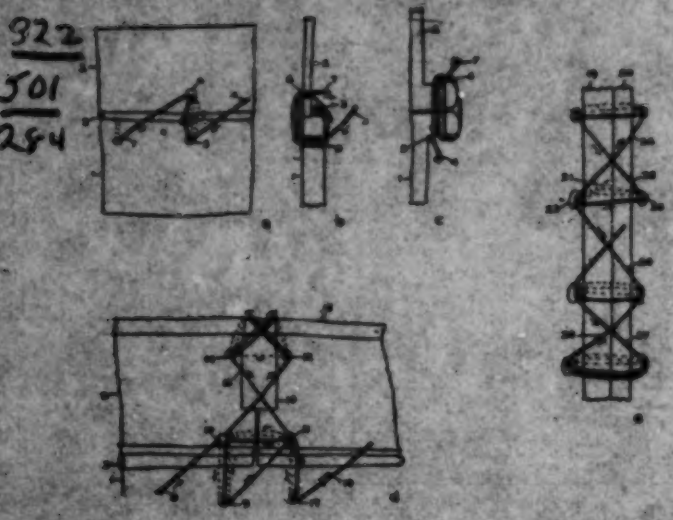

FIGURE 68.—Lashing of washstrake to hull: *a-c*, single diagonal lashing (*te hoeo tai*); *d*, double diagonal lashing (*te hoeo lua*); *e*, inside flange lashing. *a*, view of single diagonal lashing from hull interior: 1, hull section; 2, washstrake; 3, caulking stick (*tahe*) placed against caulking husk material; 4, commencement end of sennit passes from preceding hole down to inferior hole (5), through to hull exterior, and up to superior hole (6), then back through 6 to hull interior, down to inferior hole; makes one more turn and when brought back through superior hole a second time, passes down to inferior hole (7) ready for next turns. *b*, cross section of same lashing on *tai hata* canoe (through-and-through lashing): sennit (4) makes two transverse turns through inferior and superior holes (5, 6), securely binding washstrake (2), hull (1), and caulking material (3); 7, free end ready to pass to next inferior hole. *c*, cross section of same lashing on inside flange canoe (*tai au tahi*): lashing (4) makes two transverse turns through holes (5) in hull and (6) in washstrake, and free end (7) passes to next pair of holes. *d*, lashing of contiguous sections of washstrakes by double diagonal lashing: commencement end of sennit (8) makes two transverse turns through holes 10 and 9 of washstrake and hull; free end passes to inferior hole (11) in contiguous washstrake section; one transverse turn made between holes 11 and 10, and on second turn sennit passes on outside of canoe, through to inside at hole 10 and diagonally up to superior right hole (12), securely gripping gasketwork material (13) which is laid over join of washstrake sections as caulking; sennit passes through hole 12 and along on outside of washstrake to hole 14, back through 14 and diagonally up and over edge of washstrake (15); sennit continues down on outside of washstrake to hole 12, through to inside and diagonally up, over washstrake edge, down to and through hole 14; two more diagonal cross turns made over washstrake edge and free end of sennit brought back and through hole 14 to inside of washstrake; sennit (16) continues diagonally down and across to hole 11, passes through 11 and makes two transverse turns around hull and washstrake between holes 11 and 17; free end (18) passes up to next pair of holes

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sections are lashed by the in-board bar lashing (fig. 97d). Caulking material of dried coconut husk (pola pou) is hammered into the joins of hull sections with a cone-shaped wooden caulker (tamoumou). The lower edge of the washstrake is set on the upper edge of the hull, flush with its outer surface. Outside (house ends only) or coconut husk fiber is laid on the lower edge of the hull; on top of this caulking material is laid a fiber cable (tahe). The lashing of cables to hull holds the caulking securely in place (fig. 97b). The holes through which the lashing passes are caulked with coconut husk or wooden plugs hammered in from the outside with a rectangular-shaped wooden caulker (tui). These plugs keep the lashing tight and prevent leakage and rotting of the lashing. The raised bait deck, which is fashioned from the stern cover of the hull up with extra wood is shown in figure 98a. The stern cover is lashed to the hull by through and through lashings (in house tui) and caulked on the outside by fiber cables (pahipahi). The two-piece bow cover is lashed to the forward section of the hull by through and through lashings.

The outrigger is attached to the canoe by cross beams lashed to washstrakes with the crescent-shaped curved lashing which passes over the beams and through holes bored in the strakes. The longitudinal spar is also lashed to cross beams with the short-swing curved lashing. The outrigger is fastened to cross beams by connecting pegs (tatahi). Bow and stern cross beams are connected by four pegs; additional cross beams by two pegs. The points of the pegs are driven into the outrigger, but not lashed to it. The lashing of pegs to cross beams is shown in figures 98e-f, and 98h. A diagonal bracing strut (tatahi tahai) runs from the inner pair of pegs to the beam. The attachment of this strut to pegs and beam is shown in figure 98c. A supporting lashing (sengo) supports the outrigger and prevents it from separating from the pegs when the canoe is lifted. This lashing is shown in figure 99. The forward cross beam is shorter than the after cross beam. This enables the outrigger float to be fixed so that the fore end of the float is nearer the canoe hull than the after end (see construction, p. 284), an arrangement which makes the canoe easier to steer.

The fore lifting bar is lashed across the washstrakes forward of the forward cross beam. A stern lifting arrangement is made by fastening a lifting bar across the strakes just forward of the rear bait deck. Short longitudinal spars are lashed on either side of the washstrake to the second cross bar and cross beam (fig. 99a). To lift the canoe, lifting poles are thrust between these spars and the washstrakes from the starboard side and the canoe is lifted by upward pressure on the lifting pole. In large canoes, a lifting pole is also thrust through the lifting loop (fig. 99b) and when the weight is taken, the distal end of the lifting pole rests on the port side of the washstrake. All Pukapukan canoes have an extension fore and aft of the hints spar beyond the fore and aft cross beams, which is a certain nuisance in paddling on the port side of the canoe because the paddle, in being raised from the water, often strikes against this extension. However, to take a canoe through shallow water over the reef, the crew wades and drags or

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to continue single diagonal lashing of washstrake to hull as shown in a. r, inside flange lashing of hull section to hull canoe; sq and sq represent contiguous raised flanges of contiguous hull sections; ps, buried commencement and of sennit on outside of hull; sennit makes one transverse turn through holes sn and sq, then passes diagonally up (ds) to superior pair of holes; makes transverse turns through holes and passes diagonally down (ds) to hole sq, makes one turn through holes sq and sn, again binding commencement end (ps); sennit passes diagonally down (ds) to next pair of flange holes in hull, makes one turn through holes, passes (ds) to next pair; two transverse turns sennit through lowest pair of holes and sennit brought back on pass diagonally upward (ds) to next pair of holes, makes turn through holes, passes diagonally up to next pair; free end passes into hole sq, where it fastens by hammering of caulking wood into flange hole on top of free end.

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pushes the canoe, using the washstrakes and spar extension as shafts. The man in front stands between the side of the canoe and the spar extension, grasping the washstrake with his right hand and the *hiato* extension with his left. Similarly the man in the rear stands and pushes the canoe before him.

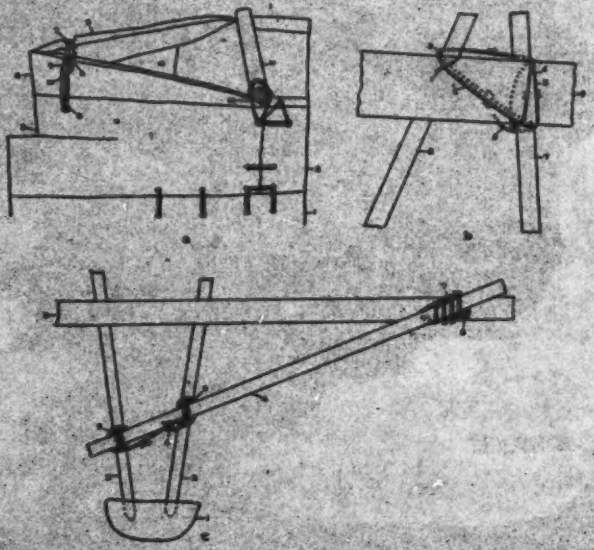

FIGURE 28.—Canoe construction. *a*, two-piece stern bait deck: 1, stern hull section; 2, washstrake; 3, section of stern cover (*vele*); 4, 5, fitted sections of wood placed on top of forward end of stern cover and lashed to cover by sennit which passes over notches 6 and 7 cut on edge of extra sections, and through hole 8, bored through head of stern cover; lashing consists of buried commencement (9), several transverse turns over notches and through hole, and buried finishing end (10); forward ends of added sections continued under first crossbar (11) lashed to washstrake on either side; lashing (12) securely binds in place added sections to washstrake; 13, platform of bait deck formed by top of stern cover. *b*, commencement lashing of connecting pegs to outrigger boom; diagram shows inner pair of pegs (7, 8) and outrigger boom (9); 1, buried lashing commencement; sennit passes around far side of inner peg (8), then diagonally down (2) and across boom to near side of outer peg; continues around far side of peg, then diagonally up and across far side of boom and around far side (3) of inner peg; continues across far side of boom, around far side of outer peg and down (4) near side of outer peg, passing over earlier turn; continues underneath and up far side of boom, down (5) again on near side of boom, underneath outer boom, then ready to pass diagonally up on far side of boom across to top of inner peg (8); lashing continues with 6 figure-of-eight turns around connecting pegs and boom, then two circumferential turns around connecting pegs superior to boom; actual connecting pegs brought close together above boom so that thick sennit must be forced between pegs for two circumferential turns, and closeness of pegs holds turns tight; free end of sennit passes along boom to outer pair

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of connecting pegs and repeats lashing; free end passes down outer connecting peg to commence suspensory lashing around float shown in figure 29, *c*, lashing of diagonal brace (*tuuki iohui*) to connecting pegs and cross boom of outrigger: 1, cross section of outrigger float into which connecting pegs (2) are driven; 3, outrigger boom; 4, diagonal brace lashed to connecting pegs by alternating curves pattern lashing (5); lashing has buried commencement on outer peg; after completing lashing of outer peg, free end of sennit continues to inner peg, completes similar lashing; free end (6) fastened by double overhand knot to sennit that came from outer peg; lashing of diagonal brace to outrigger boom has buried commencement (7); free end of cord makes three or more transverse turns around brace and boom, then one or more circumferential turns around lashing turns between brace and boom and finishes with overhand knot on last circumferential turn (8).

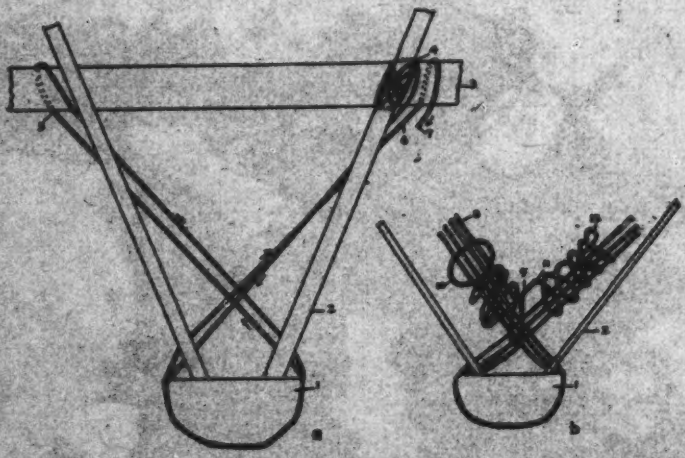

FIGURE 29.—Suspensory canoe lashing. *a*, commencement of lashing between outrigger boom and outrigger float: 1, outrigger float in cross section; 2, connecting peg between float and cross boom (3); when lashing (4) of outer connecting peg to cross boom is finished free end of sennit brought down between double pair of pegs (only outer pair shown in diagram) to inner side of float, passes around under float, up on outside of float and across to boom at 5, on hull side of inner peg; turn made over boom, and sennit brought down to outer side of float, around float, and up on inner side (6) to boom, making turn around boom on outer side of outer peg; sennit (7) continues down to float as before, making altogether five turns around boom and float (two turns only shown in diagram). *b*, continuation of suspensory lashing: after fifth turn (fourth in diagram), free end of sennit (8) brought down from hull side of inner connecting peg to pass around and under crossing of suspensory lashing (9) and continues up left hand suspension with two transverse turns; a complete final turn made around suspension, and sennit (10) brought back down suspension with two more transverse turns, continuing across to right hand suspension (11); five transverse turns made around right hand suspension with buried end finish (12).

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Flaws in the wood from which hull or strakes are made are cut out and in their place small sections of wood (*tapihi*) or larger sections (*waka-kaukau*) are fitted in by hammering and lashed if necessary to the surrounding hull or washstrake wood. Where the washstrake wood is not sufficiently deep, additional sections (*waka-pali tai*) are lashed with through and through lashing to the washstrake base until the required depth is attained. Small cylindrical plugs of wood (*tapihi* or *mono*) are hammered into small knot or flaw holes in the outrigger float to keep the salt water from lodging in them and rotting the wood.

When surfaces are being fitted together, whether hull sections, or washstrakes to hull, or small patch sections to hull or strakes, the parts to be joined are smeared with a marking material of coconut-shell charcoal mixed with water and applied with a brush made of the chewed fibrous material of the pandanus key. Irregularities in the fitting of the parts are brought out by black marks. These irregularities are then adzed down until a perfect fit (*ave* or *tomoemoe*) is secured.

In canoes used in bonito trolling, the rear seat is made of a block of wood which is lashed on either side with through and through lashings to each washstrake. A flange is cut on the under aft side of this seat and a semit grommet (*matapili*) is lashed to the seat in the middle of this flange. The butt holder (*tuhau*) of the bonito pole (*matiki atu*) rests in this grommet and the pole rests in a groove cut in the after lifting bar.

[501] The size of a canoe is indicated by the number of seats (*yoko*) it contains. But a *vaka yoko ma* (four-seater canoe) holds only three men comfortably; a *vaka yoko lima* (five-seater canoe) holds four men comfortably or five men if the hull is especially wide; a *vaka yoko ono* (six-seater canoe) holds six men. From this number of seats upward, the number of crew becomes greater than the formal seating capacity, so that a 60-foot canoe, officially rated as a *vaka yoko lourgaulu ma tolu* (thirteen seater), easily holds 30 or more men. Those that cannot be accommodated with formal seats rest on the edges of the strakes. The size in feet of the various canoes is given below (p. 185).

The hull of the *tatai* plank canoe is of one piece in very small one-man canoes or of three pieces in larger canoes. The hull sections are as before, *mua vaka*, *mualoto*, *muli vaka*. Washstrakes are added and a simple bow cover (*pupuni hi mua*) and a stern cover (*pupuni hi muli*). These covers are shaped pieces of wood lashed to hull and to washstrakes (fig. 30,*c*). Very rarely, a small canoe of this type is fitted with the shaped stern piece (*volo*) and the type bow covers (*tuki* and *puka*). Outrigger support consists of two cross booms, connecting pegs, and suspensory lashing. The *tatai* canoe differs from the simple one-piece dugout in the addition to the hull of washstrakes and stern and bow covers. The size of typical *tatai* canoes is given below.

The plank canoe termed *vaka tai matali* (pl. 5,*B*) is distinguished from the through and through lashed canoe (*vaka tai tuto*) by the lashing of hull sections to each other, and of washstrakes to hull, and washstrake sections to each other by means of raised inside flanges (*honga wahatiko* or *honga tai matali*). These flanges are about 2 inches high and the lashing is through

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322 holes drilled through each flange (fig.27,*c*,*e*). No lashing shows on the outside of the hull. This lashing method may be applied to plank canoes 501 of all sizes from the simple *tatai* canoe to the largest canoe.

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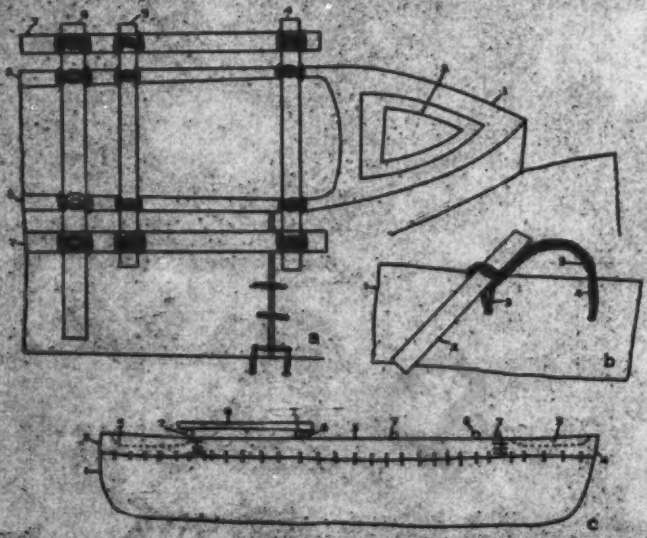

FIGURE 27.—Plank canoe. *a*, arrangement of lifting bars at stern of canoe: 1, raised bait deck (*wakakaveve mona*); 2, bait receptacle (*tuku pakupaku*); 3, washstrake of canoe; 4, cross lifting bar (*mana hi muli*); 5, second cross bar (*mana a lua*); 6, cross boom supporting outrigger float; 7, longitudinal members (*pulepale langaya*) lashed to cross members; lashings all of alternating curves pattern. *b*, lifting loops of sennit (*tuinga ihi*): 1, section of washstrake; 2, cross boom; 3, lashing of boom to strake; 4, four turns of sennit made through hole in strake and around lashing of boom to strake; 5, seizing of these four turns, buried commencement and finish. *c*, *tatai* canoe: 1, one-piece hull; 2, stern cover (*pupuni hi muli*); 3, washstrake; 4, bow cover (*pupuni hi mua*); 5, dotted lines show lowered bait decks in covers; 6, cross booms to outrigger float; 7, short lifting bars; 8, short longitudinal spars (*pulepale langaya*) forming lifting supports for stern of canoe.

501 The *tai tatai* canoe has definite advantages for reef work over the [221] through and through lashed canoe because of the absence on the outside of 321 the hull of lashings to be cut by sharp coral heads. It has this disadvantage, however, that the water seeps in through the hull joins and rots the wood about the joins of the hull sections. This seepage cannot be prevented by caulking as with the *vaka tai tuta* lashing. If a canoe is used much, the wood

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about the hull joins is seldom dry, and after about 10 years the wood becomes so rotten that the flanges break apart. The only remedy is to take the canoe apart, adz off the rotten sections of wood, and rejoin the canoe as a *vaka tui tuta*. The sennit lashing of the *vaka tui tuta* lasts about seven years before it rots. It is easily replaced if care has been taken of the canoe and the wood round the joins has not become rotten through unsuspected water seepage.

The customary Pukapukan canoe for deep-sea fishing or voyaging was the single outrigger canoe. At various times, however, the double canoe (*taulua*) was made and used, particularly for regular fishing trips to Tima Reef. A time is remembered when three double canoes were in commission on the atoll. Tradition seems to indicate that the art of making double canoes was introduced by returning Pukapukan navigators. The chief Wue (who lived about 14 generations ago) is reputed by some to have been the first man to build a double canoe in Pukapuka; he modeled it after one he had seen in his travels abroad. Lack of sufficiently large timber is given as the reason why few double canoes were built. No informant had seen a Pukapukan double canoe. The following brief description is based on traditional information only:

The larger of the two canoes was to leeward and carried the two masts. The smaller canoe acted as an outrigger and was to windward. Cross booms (*hauhau*) joining the two canoes were probably logs of pandanus, three booms being necessary to provide a stable support. Both canoes were completely decked with logs of *pumpus* wood, save for holes or hatchways that served as bailing cockpits and gave entrance to stores and fishing gear loaded inside the hull of the windward canoe. Diagonal cross braces from the stern and bow of each canoe to the fore and aft cross booms were termed *tekei*. A platform (*papanga taulua*) laid across the booms was occupied by the crew and passengers who also used the leeward canoe for shelter. On one part of the platform was placed a small house which functioned as a god house (*uale atua*). No details are preserved of lashings or sizes of these double canoes. But it is likely that the reason the single outrigger was the preferred canoe is that it could be made more seaworthy because the outrigger could be more strongly lashed to the hull than as the big and unwieldy double canoe. The double canoe was steered by two or three steering paddles, one man steering from one canoe and the second man from the platform between the canoes. Should a sudden turn be desired, the two steersmen were reenforced by a third who assisted from the stern of the second canoe.

To change the direction of any canoe is *uuli* or *uuuuli*. The change of direction is to starboard (*ki katea*) or to port (*ki ama*). The bowman calls out the direction of change thus: *La ama!* or *La katea!* When the required direction is defined, he calls out: *Tawi ai!* (Hold it now!)

Variations on the fundamental construction pattern of the Pukapukan canoe are few:

In one single-piece dugout canoe, rather large for its type, greater stability was given to the two outrigger cross booms by projecting the ends of these booms about 18 inches beyond the starboard side of the hull and lashing to these ends a longitudinal

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

spar parallel to the customary longitudinal spar (*kisto*) lashed to the cross booms on the port side of the canoe. Informants also mentioned that formerly a big canoe made for fishing off the grounds by Tima Reef was fitted with two stern pieces (*tvio*). The *tvio* was cut from a single wide block of wood and two fish-tail ends were adzed out instead of one. This variation was characterized as a type of decoration (*waka ramea*) without utilitarian function.

One canoe in active use had attached to the hull only half of the customary two-piece bow cover. The fore part of the bow, usually covered by the *tuhi*, was open, but the after part of the cover, the *puha*, complete with wave guard (*malae puha*), was securely lashed to the hull. Informants remarked that this was an idiosyncrasy of the builder of the canoe. He had been faced by a shortage of wood during construction some years previously and had not since bothered to complete his canoe, but was on the contrary rather proud of its odd appearance.

Sails

Two types of sail, both said to be old, are in use today when canoes sail to the islets. The first is a triangular sail, *la mata kookoo* (*kookoo*, pointed); the second, a gaff sail, *la liaki a Te Palo*, named after the Yayake navigator who visited Pukapuka. Both types of sail were formerly made of pandanus (*lou uulu*) plaited in single element check (*langa tai*). The sail was made large enough to allow for an overlap which is basted over the sennit becket rope (*uuvuti hi loto o te la*) by which the sail is supported on the mast. (See figs. 31, 32.) The basting was done (*tui*) with pandanus material (*tuu kio*) through holes made with a bone of the *akulo* fish or a piece of *ngangie* wood. Sheets (*tupoupou*) of two-ply twisted sennit are fastened to the becket ropes by overhand knots.

Formerly the mast (*tila te*) was made in two parts: a crotch (*tue manga*) was lashed to the mast pole (fig. 31,b). The mast was raised by resting the crotch end on the forward cross boom (*kaukau hi uma*). Several turns of sennit were made around the boom to prevent the crotch from slipping sideways. Stays (*tuku*) supporting the mast are shown in figure 31,c.

The sail is supported by the top of the mast in one of three ways: the guy (*uuvuti*) by which the sail is hauled aloft may be passed through a hole (*pu*) bored through the top of the mast; the guy may be passed over a natural branch cleft (*tue manga* or *kakee*) at the top of the mast and passed down to the canoe; the becket (*pu*) in the peak of the sail may be passed over the top of the mast before the mast is raised—the mast is thick enough at this end to prevent the becket from slipping down. The last method is used only in small canoes. In all three methods when the sail is aloft the guy is fastened to the port side of the forward outrigger boom.

Today, the mast is usually long enough to rest against the bottom of the canoe. It is lashed to the forward cross boom with figure-of-eight turns of heavy sennit, or else the stay passing from masthead to forward lifting bar is continued back to the cross boom to make several turns around both mast and cross boom. Ultra-modern Pukapukan sailors step the mast in cup-shaped blocks cut out from the floor of the hull, or else lash to the washstrakes planks with holes in them through which the mast is stepped.

The sail is further supported by a horizontal boom (*tila lalo*) with a crotch at one end, resting against the bottom of the mast just above the lashing of mast to cross boom. The other end of the boom (*uhu tila lalo*) is fastened to the sail by a becket. A main sheet (*tuuvu*) of sennit is fastened by a clove hitch to the boom from which it runs to

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the hand of the sailor. When the canoe is sailing before a steady wind, the main sheet is fastened to a cross boom or lifting bar, or else it is gripped underneath the foot of the sailor.

At the inner, lower end of the sail the becket rope passes from the sail and is now termed *mali la*. It is fastened to the forward cross boom, or else its two ends are tied into a loop which is slipped over the crotch of the boom. Either method keeps the inner, lower end of the sail from bellying loose in a high wind.

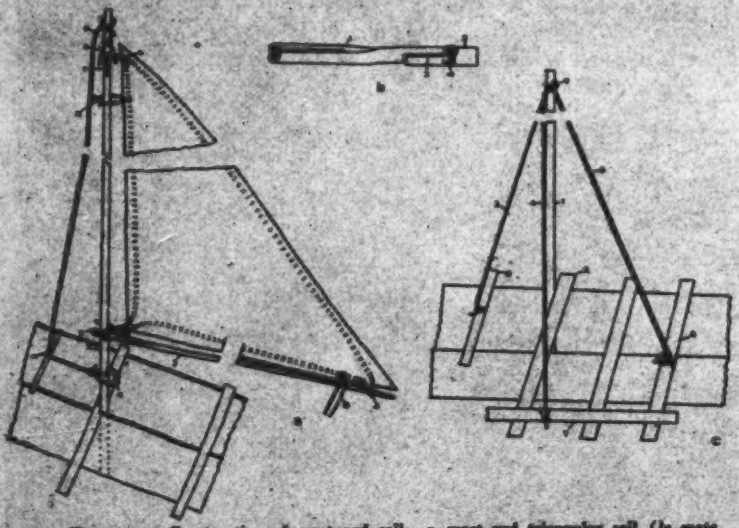
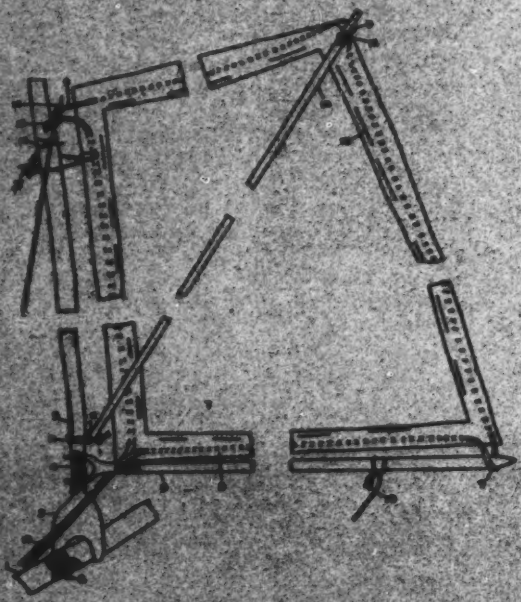


FIGURE 31.—Construction of mast and sail. *a*, mast and triangular sail (*la mata ikoiko*): 1, cross boom; 2, mast; 3, boom with crotch end resting against mast; 4, outer becket, hooked over end of boom; 5, inner becket sennit ends, fastened with overhand knot in loop which passes over end of crotch to keep sail taut; 6, peak becket, fastened to guy by overhand knot; 7, guy passes through hole in mast and down to cross boom where it fastens; 8, mast stays passing to after booms as shown in *c* below; third inner stay (9) passes down to forward lifting bar, makes two turns (10) around bar and passes again to cross boom to make two turns (11) around boom and mast, holding mast in place against boom; overhand knot finishes turns; 12, sheet, fastened to becket sennit and to mast by overhand knot; 13, main sheet, fastened to becket sennit by overhand knot and passes to canoe aft. *b*, attachment of crotch (*vae manga*) to mast spar: crotch (1) scarfed and fits against scarf (2) cut in mast spar (3); commencement of transverse lashing turns (4) which bind crotch and mast at scarf join. *c*, staying of canoe mast: 1, mast stands inside of canoe, lashed to cross beam (2) (lashing not figured); 3, 4, 5, stays fastened to top of mast by clove hitch (9); 3, forward stay fastened to forward cross lifting bar (6); 4, stay fastened to longitudinal spar (7) aft of cross beam; 5, stay fastened to middle cross beam (8) at washstrake; stays fastened to booms by clove hitches; weight of sail, filled by wind, provides counter-balance on outboard side of canoe to port side pull of stays.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

502 In a heavy wind, the mast of a triangular sail is kept vertical. To catch the greatest amount of moderate or light wind, it is hauled over to an angle of about 30 degrees with the vertical. The boom runs from the mast at an angle of about 60 degrees, and the sail functions then with its base upward and the apex down. This is the usual way of mounting the triangular sail.



501 Figure 32.—Mast and gaff sail (*te hiki a Te Pale*): 1, stone boom to outrigger, on which crutch (*tau manga*) (2) of mast (3) rests; 4, lashing on crutches to prevent mast from slipping; 5, lashing binding crutch to mast spar (3); 6, boom with crutch resting against mast; 7, gaff sail; 8, bucket amidships hauled into overlap of sail; 9, lashing which pass over end of supporting spars and keep sail taut; 10, spirit or gaff which extends outer peak of sail, resting at lower end in socket (11) of mast made by passing clove hitch around mast and tying free ends of mast in overhand knot; 12, upper end of spirit, bucket prevented from sliding down spar by looping turns (13) taken around end of spirit; 13, heavy lines indicate seizing of quarling to hold bucket amidships; 14, outrigger branch cleit (*tau manga*), over which bucket hoops when sail is hauled up by means of guy (15) fastened to bucket by clove hitch; 16, stays run to bottom to support mast (see fig. 31, *c*); 17, sheet fastened to bucket amidships with overhand knot and looped around mast with double overhand knot; only one sheet shown, but average sail has about six sheets for mast and for boom; 18, main sheet; fastened to boom by clove hitch, runs to miller seated aft in canoe; 19, two ends of bucket amidships (small lo) pass in and are fastened around cross beam (1).

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

An extra sail support is needed with the gaff sail (fig. 32). This sprit is termed *toko*. At the lower end it rests in a snotter (*wakaaunga no te toko*) fastened to the mast. In a strong wind blowing directly aft, the gaff sail is supported by a further stay that runs from the head of the sprit to the stern cross lifting bar, occasionally to the curve of the stern piece around which it is fastened.

For a one-man canoe for sailing to the islets, a rough-and-ready sail is made from a coconut-leaf mat (*takapau*). A pole is stepped in the canoe and lashed to the forward cross boom. The midrib side of the mat is fastened to the pole with sheets of coconut fiber (*kaiawa*) and the outer edges of the mat stayed by guys passing to the hand of the sailor who sits in the stern of the canoe and steers. A *takapau* mat catches ample wind to speed along a small canoe.

The mast of any Pukapukan canoe is mounted at either end of the canoe, the outrigger being invariably kept to windward. The canoe can not tack without unshipping the mast and setting it up at the other end of the canoe. Sailing fast (*kaiali* or *yolo*) in a heavy wind, some members of the crew rest their weight on the outrigger cross booms in order to counterbalance any tendency of the outrigger to lift out of the water. Under sail a Pukapukan canoe lies close to the wind, but tends to make rapid leeway for want of a keel.

Paddle and Bailer

The Pukapukan paddle (*wee*, fig. 26,*d*) has a projecting knob (*mata*) at the distal end of the blade. This knob has a dual function. It protects the blade (*laulau wee*) when the canoe is being poled over lagoon shallows, and, when the paddle is brought from the water with a sharp wrench after a short jab stroke, the knob makes, in contact with the water, a short, sharp, ringing sound (*hoo tangi te wee*), used to attract fish to the fishing canoes. It is a very characteristic sound in Pukapukan paddling, and whenever it is necessary to imitate a canoe in May Day play festivals, a file of men walk about making this sound with their lips, at the same time raising and lowering their arms.

The paddle is used on both port and starboard sides of the canoe. The outrigger does not offer great impediment to the typical short, jabbing stroke of the Pukapukan paddler. Any paddle is used indifferently for steering and paddling. Formerly the paddle was always held with the back (*tua*) turned toward the rear of the canoe. This usage (*ulo tua*) is reserved today for short spurts and for making the paddle resound, the front (*alealo* or *vakevake*) of the paddle being now customarily directed toward the rear.

Each canoe has as part of its equipment a long pole (*toka*) used for poling the canoe over reef shallows. Some canoes returning to Wale from Motu Ko long the reef circuit and make good speed with two people poling, one in the bow and one in the stern.

The bailer (*tata*, fig. 26,*g*) is of common Polynesian type. It is not decorated with carving. In use, the bailer is not filled, lifted, and emptied over the side of the canoe, but water is gathered from the bottom of the hull and shot out with one vigorous and continuous scoop. In small canoes, an empty coconut shell serves as a bailer.

Measurements

The principal measurements of seven Pukapukan canoes are given in Table 3. These measurements may be compared with those of the 13-seater canoe shown in figure 25.

The amount by which the forward end of the outrigger float is set to starboard to assist the steering qualities of the canoe ranges in the canoes measured from 2 to 6 inches, with an average of about 3½ inches. Pukapukan canoe builders gave no rule

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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for judging this amount, but said that they judged by the eye. Kennedy discovered from a study of canoes of Vaitupu that the "limiting amount by which the forward end of the float is set to starboard is about one hand's breadth from a line through the after end of the float parallel with the hull" (19, p. 94); this amount agrees closely with the Pukapukan average for this starboard set, though there seems to be little correlation between the size of the canoe and the amount of starboard set considered necessary. The required balance weight of the float seems to be obtained almost entirely by lengthening the float, for the width and depth of the float do not vary greatly save for the larger canoes. The length of the float in relation to the overall length of the canoe indicates that the Pukapukan builders unconsciously judged the float length by some such rule as Kennedy (19, p. 79) gives for Vaitupu where the outrigger is given a length such that the forward end will be laterally opposite the feet of the bow paddler and the after end opposite the feet of the rearmost paddler. Again, Pukapukan builders could give no rule for judging the proper length of the outrigger float save an eye judgment.

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Table 3. Canoe Measurements

Type	1 Overall Length	2 Beam (Gunwales)	3 Beam (Hull)	4 Depth (Center Canoe)	5 Length, Forward Canoe Body	6 Forward Canoe Body, Hull to Outrigger	7 Rear Canoe Body, Hull to Outrigger	8 Length, Longitudinal Spar	9 Length, Outrigger Float	10 Width, Depth, Outrigger Section	11 Length, Bridge Piece (Top to Gunwale Joint)	12 Length, Bow Piece (Top to Gunwale Joint)
Single dugout (large)	16′	14″	14″	16″	7′ 5″	6′ 3″	6′ 7″	9′ 10″	12′	5½″×4½″	—	—
Tuasi tolusua two-man canoe	10′ 6″	10″	8″	17″	5′ 5″	4′ 7″	4′ 9″	6′ 4″	7′ 8″	5″×3″	—	—
Tuasi tokolua two-man canoe	19′	11″	9″	18″	6′ 6″	5′ 7″	5′ 10″	9′	13′ 3″	6″×4″	4′ 3″	3′ 9″
Yeke tolu 3-seater	16′ 6″	11″	7″	15½″	5′ 6″	4′ 10″	5′	9′ 6″	12′	5″×3½″	3′ 6″	3′ 7″
Yeke ua 4-seater	21′ 11″	14″	11″	18″	6′ 6″	4′ 8″	5′ 1″	10′ 4″	16′ 4″	6½″×4″	5′ 11″	5′ 4″
Yeke ono 6-seater	35′ 6″	15″	11″	20″	8′ 1″	5′ 10″	5′ 10″	18′	22′ 6″	7″×8″	5′ 2″	6′ 7″
Yeke iva 9-seater	51′	22″	14″	27″	8′ 8″	7′ 8″	8′ 2″	27′ 6″	32′ 8″	7″×7″	—	—

FISHING EQUIPMENT

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Besides fishnets (p. 208) and hooks (p. 191), fishing equipment includes lines, fishing rods, composite fishing apparatus, clubs, fish spears, and hook containers.

FISHLINES

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Lines of sau fiber are used on composite pearl-shell fishhooks where quality rather than length of line is important. Three-ply braided sennit

1:Beaglehole and Beaglehole E-5 (1934-5) 1938 Pukapukans

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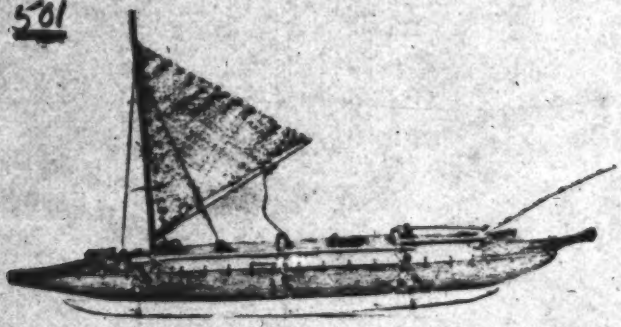
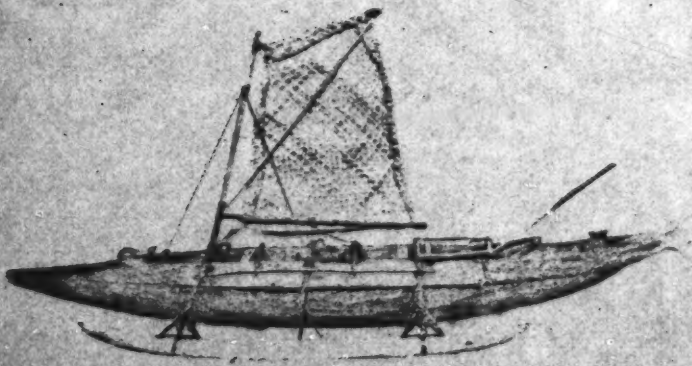


A



B

CANOES. *A*, THROUGH-AND-THROUGH LASHED CANOE, WITH TRIANGULAR SAIL OF PANDANUS MATTING; ROD IN STERN SHOWS POSITION OF BONITO ROD WHEN THE CANOE IS TROLLING. *B*, CANOE WITH INSIDE FLANGE LASHINGS AND GAFF SAIL. BOTH CANOES ARE MODELS, AND PROPORTIONS OF BOW AND STERN COVERS TO REST OF HULL ARE ONLY APPROXIMATELY CORRECT; OTHERWISE CANOES EXACTLY MADE.

2: Macgregor E-2 (1933) 1935 Pukapukans
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[Information in this source which is either inadequate, incorrect or duplication has only been filed in category 116: for description of canoes, their construction and lashings, see pp. 34-42.]

2: Macgregor E-2 (1933) 1935 Pukapukans

through holes in the projecting edge of the underbody. The end booms are attached to the float by four stick connectives and a sennit brace, as described for the fishing canoe. The middle booms have two connectives, which are undercrossed. The after connective, like the after pair in the four stick connectives, runs obliquely to the boom. A diagonal strut runs from each boom to the forward connective. The outrigger is braced by six struts lashed across the gunwales—one between each pair of booms and two between the forward pair—and by connecting strings. Between the last pair of booms there are three stringers which make a platform for paddles or fishing gear.

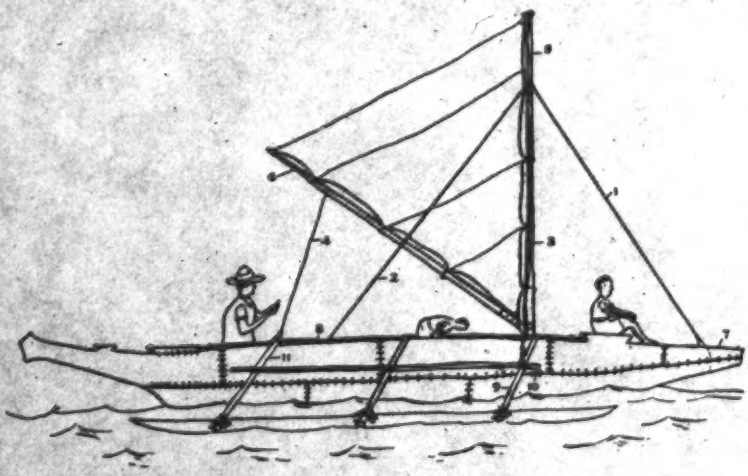

FIGURE 11.—Sketch of sailing canoe with rigging: 1, fore stay running from bow of canoe to mast; 2, back stay running from mast to washstrake; 3, starboard shroud from mast to bow outrigger boom and stringer; 4, sheet running from yard to stern outrigger boom; 5, mast set through hole in bow seat or lashed to bow outrigger boom, and set on floor of hull; 6, yard; 7, bow of canoe; 8, washstrake; 9, bow outrigger boom; 10, stringer; 11, stern outrigger boom. Drawn by a native.

The stern has no cross lifting bar, and the lifting pieces are lashed directly to the stern boom. The wave guard of the stern cover is made of separate pieces lashed to the cover (fig. 10, *b*).

The stern seat is between the fishpole rest and after boom and has the notch and loop for supporting the pole butt. Short planks or seats with holes for the two masts are lashed to the strakes behind the bow and fourth booms. The masts of this large canoe are stepped in cup-shaped blocks cut out on the floor of the underbody.

539 Wutia te kai kia malie!	Delicious is the food gathered for me!
Malamalama te tawa ki Ngake,	Daylight breaks in the eastern sky,
Malama e e.	It is light.

A tila of the expedition to Motu Ko (1)

E vananganganga te pule,	The guard of the islet gives the announcement, (2)
Te koyo o Te Alo-lauina	Husking sticks are placed on the canoe named Te Alo-lauina
Ka yolo te vaka e, ka yolo	The canoe will speed along, speed along.
Te toki o te toli kauwi	Ready is the adz for cutting pandanus keys,
E payi wano ki te ayanga,	Our canoe is a vessel going along the outer reef.
Tuta, wano ki te Nukuloa	Stopping, then going on to Motu Ko.
Viovio ko te iki tawia, iki na,	We erect the anchor sticks, (3) anchor the canoe,
Na lele loa ki loto, yoka i te niu mata.	Rush into the islet, husk ripe drinking nuts.
Wakanau ake au: malie te kikokiko,	I sing praise: sweet is the coconut's flesh,
Tama o te ulu wutu.	Child from the grove of wutu trees.
Onoono atu au ki te pakayau ngongo,	I watch the wings of the noddy tern
Ko tipitipi ki lalo i te koanga wua,	Dipping low over her nest of eggs,
Lele au i te ata, tango i te mulimuli ngungu.	I run under its shadow, grasp its grunting tail.

1. This short chant records an expedition made by Ngake villagers to their reserve islet Motu Ko to gather food and catch birds.

2. The food reserve is controlled by the village acting through a guard composed of village members. When a village council decides to take food from its reserve, it is the duty of the guard to announce this fact and arrange the particulars of the expedition. See [1:] Beaglehole [and Beaglehole, p.38, category 116--analyst].

[501] 3. To anchor a canoe in shallow lagoon water a long stick is thrust into the sandy bottom behind the outrigger boom in such a way as to keep the canoe from drifting.